



## 299-E28-61 (A6812)

### Log Data Report

#### Borehole Information:

<b>Borehole:</b> 299-E28-61 (A6812)		<b>Site:</b> 216-B-9 Crib			
<b>Coordinates (WA State Plane)</b>		<b>GWL (ft)<sup>1</sup>:</b> Not reached		<b>GWL Date:</b> N/A <sup>2</sup>	
<b>North</b>	<b>East</b>	<b>Drill Date</b>	<b>TOC<sup>3</sup> Elevation</b>	<b>Total Depth (ft)</b>	<b>Type</b>
136,821.1 m	573,856.2 m	August 1948	209.1 m	150	Cable Tool

#### Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel Welded	2.5	8.625	8.0	0.328	0	152

#### Borehole Notes:

The logging engineer measured the stickup using a steel tape. Stickup was measured between an engraved "X" on top of the casing and the ground surface. Calipers were used to measure the casing wall thickness and the outside diameter; the inside diameter is calculated. Zero reference is the top of casing stickup. Top of casing stickup is cut squarely. HWIS<sup>4</sup> is the source of the TOC elevation and coordinates. Total depth (ground level reference) and casing bottom (TOC reference) are reported from information provided in Chamness and Merz (1993). The borehole was swabbed on 03/12/02, and no contamination was detected.

#### Logging Equipment Information:

<b>Logging System:</b>	Gamma 2B	<b>Type:</b>	SGLS (35%)
<b>Calibration Date:</b>	11/01/01	<b>Calibration Reference:</b>	GJO-2002-287-TAR
		<b>Logging Procedure:</b>	MAC-HGLP 1.6.5, Rev. 0

#### Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4	
Date	03/21/02	03/22/02	03/25/02	03/25/02	
Logging Engineer	Spatz	Spatz	Spatz	Spatz	
Start Depth (ft)	2.5	151.5	70.0	24.0	
Finish Depth (ft)	24.5	69.0	24.5	8.0	
Count Time (sec)	100	100	100	100	
Live/Real	R	R	R	R	
Shield (Y/N)	N/A	N/A	N/A	N/A	
MSA Interval (ft)	0.5	0.5	0.5	0.5	
ft/min	N/A	N/A	N/A	N/A	
Pre-Verification	B0107CAB	B0109CAB	B0110CAB	B0110CAB	
Start File	B0108000	B0109000	B0110000	B0110092	
Finish File	B0108044	B0109165	B0110091	B0110124	
Post-Verification	B0108CAA	B0109CAA	B0111CAA	B0111CAA	
Depth Return Error (ft)	0	+1"	N/A	-0.5"	

Log Run	1	2	3	4	
Comments	No fine-gain adjustment.	Fine-gain adjustment notes below.	Fine-gain adjustment notes below.	Repeat section. Fine-gain adjustment notes below.	

### **Logging Operation Notes:**

Zero reference is the top of casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT verifier with SN 082.

During SGLS logging, fine gain adjustments were made to maintain the 1460-keV ( $^{40}\text{K}$ ) photopeak at a pre-described channel. During logging run 2, 03/22/02, fine-gain adjustments were made after files B0109121 and -154. During logging runs 3 and 4, 03/25/02, fine-gain adjustments were made after files B0110047, -052, -070, -088, -094, -104, and -116.

### **Analysis Notes:**

<b>Analyst:</b>	Sobczyk	<b>Date:</b>	04/25/02	<b>Reference:</b>	MAC-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The verification spectra were all within the control limits. The recorded peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were within 10 percent of one another at each spectrum's energy line. The recorded peak counts per second for these three photopeaks were consistently lower each day in the post-run verification as compared to the pre-run verification. The post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC Supervisor.

Spectra for the SGLS were processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated in EXCEL (source file: G2BNov1.xls), using parameters determined from analysis of recent calibration data. Zero reference is the top of the casing. The casing configuration was assumed to be one string of 8-in. casing with a thickness of 0.322 in. to a log depth of 152 ft. A casing thickness of 0.322 in. is the published value for ASTM schedule-40 steel pipe (a commonly used casing material at Hanford). This casing thickness is within the range of measurement error associated with the logging engineer's measurements. A water correction was not needed or applied to the SGLS data. A dead time correction was applied when the dead time surpassed 10.5 percent, which only occurred at log depth 21.0 ft.

### **Log Plot Notes:**

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides ( $^{40}\text{K}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$ ), and man-made radionuclides. In addition, a comparison log plot of  $^{137}\text{Cs}$  is provided to compare the data collected by Westinghouse Hanford Company's Radionuclide Logging System (RLS) with SGLS data. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The plots of the repeat logs demonstrate good repeatability of the SGLS data for both the man-made and naturally occurring radionuclides.

## **Results and Interpretations:**

$^{137}\text{Cs}$ ,  $^{235}\text{U}$ , and  $^{238}\text{U}$  (based on the 1001-keV photopeak) were the man-made radionuclides detected in this borehole.  $^{137}\text{Cs}$  was detected near the ground surface (4.0- and 4.5-ft log depth) at concentrations ranging from 0.3 to 0.4 pCi/g. Between 18 and 29 ft,  $^{137}\text{Cs}$  was detected at activities ranging from 0.3 to 220 pCi/g. The maximum  $^{137}\text{Cs}$  activity occurred at 21-ft log depth.  $^{137}\text{Cs}$  was also detected at 86.5 ft with an activity of about 0.3 pCi/g. At 36.5 and 37.5 ft,  $^{235}\text{U}$  was detected with activities of 1.4 and 1.7 pCi/g, respectively, which is near its MDL of about 1.2 pCi/g.  $^{238}\text{U}$  was detected near its MDL (15 pCi/g) at 23.5, 38.0, and 38.5 ft. In addition, man-made  $^{238}\text{U}$  was detected near its MDL on the repeat log run at 24.0 ft.

Recognizable changes in the KUT logs occurred in this borehole. Changes in apparent  $^{40}\text{K}$  activities of about 5 pCi/g occur at about 18 ft. This increase in  $^{40}\text{K}$  activities probably represents the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2.

The comparison log plot of  $^{137}\text{Cs}$  data collected in 1992 by Westinghouse Hanford Co. (WHC) and in 2002 by MACTEC-ERS is included. The 1992 concentration data for  $^{137}\text{Cs}$  were decayed to the date of the SGLS logging event in March 2002. The SGLS and RLS logs use a different depth reference, and the RLS data were shifted from a ground level reference to a TOC reference. The apparent  $^{137}\text{Cs}$  concentrations show good agreement between the logging systems. The contaminant profile does not show any significant changes over the last 10 years. The other man-made radionuclides detected by the SGLS were not detected by the RLS because the RLS counting times were 35 s versus 100 s for the SGLS.

Gross gamma profiles from Additon et al. (1978) (attached) indicate that the sediments surrounding this borehole contained gamma-emitting contamination from about 16.5 ft (5 m) to 26 ft (8 m) as early as 5/24/63.

## **References:**

Additon, M.K., K.R. Fecht, T.L. Jones, and G.V. Last, 1978. *Scintillation Probe Profiles From 200 East Area Crib Monitoring Wells*, RHO-LD-28, Rockwell Hanford Operations, Richland, Washington.

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNNL-8800, UC-903, Pacific Northwest Laboratory, Richland, Washington.

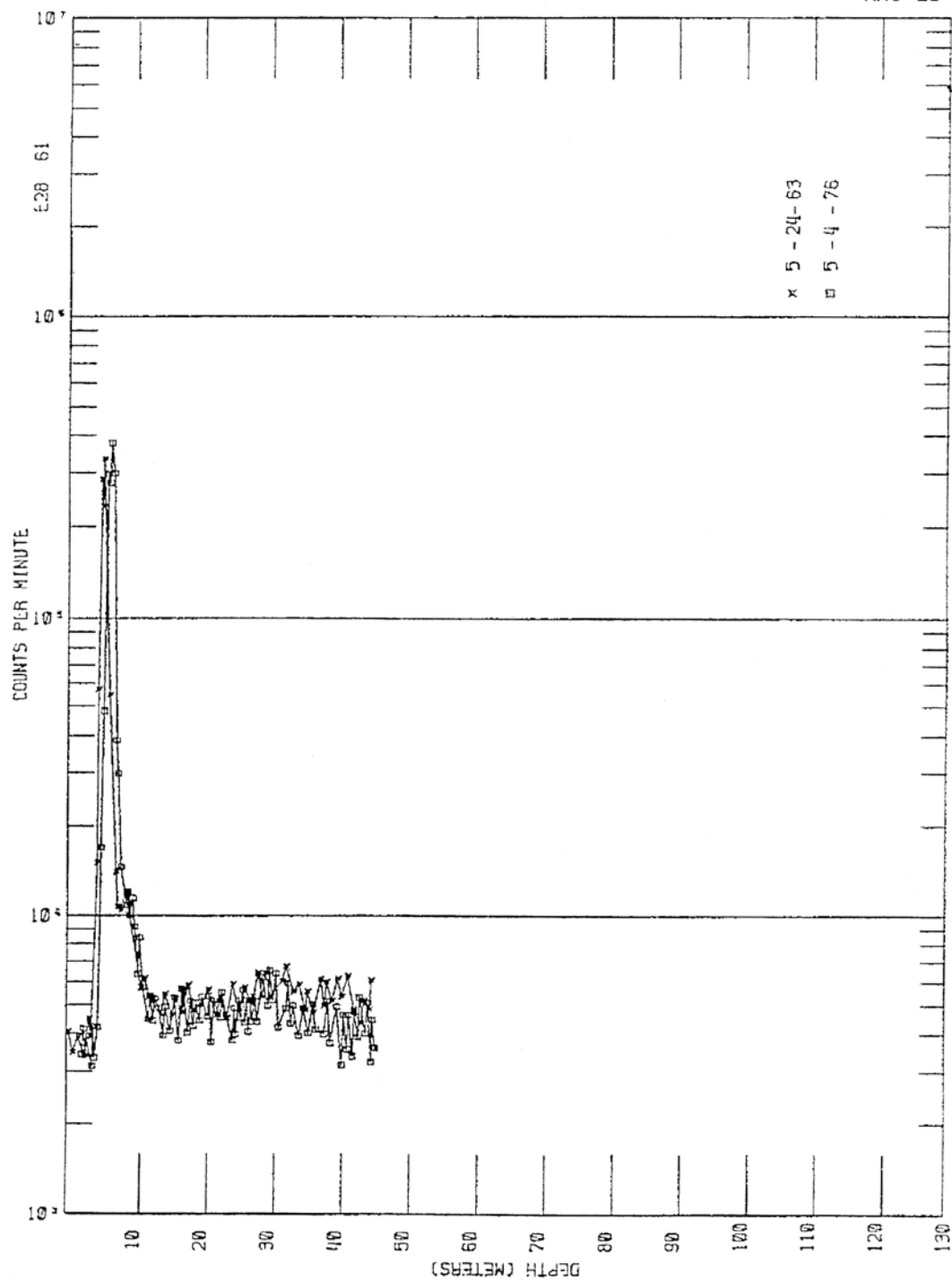
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<sup>1</sup> GWL – groundwater level

<sup>2</sup> N/A – not applicable

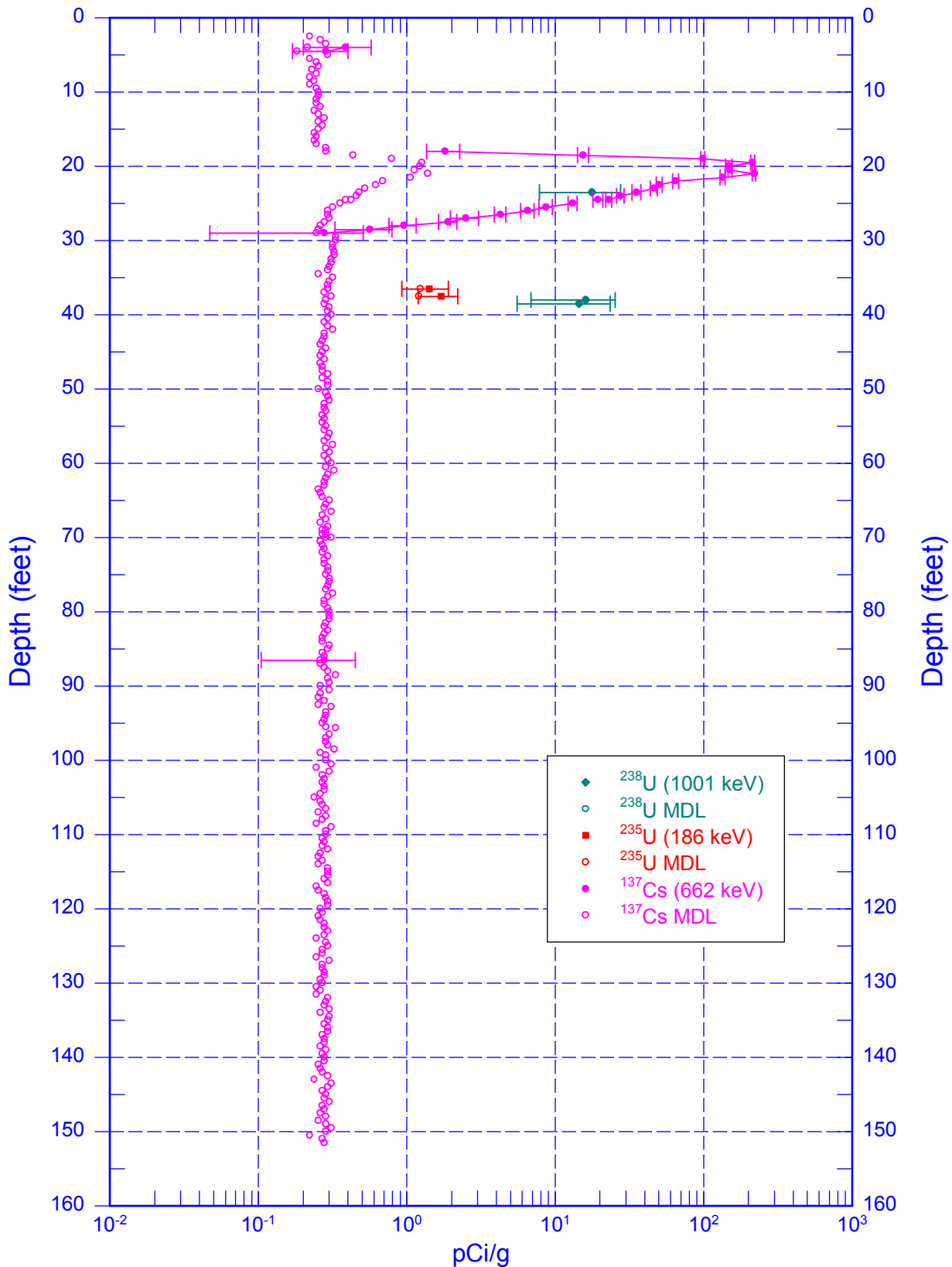
<sup>3</sup> TOC – top of casing

<sup>4</sup> HWIS – Hanford Well Information System



# 299-E28-61 (A6812)

## Man-Made Radionuclides

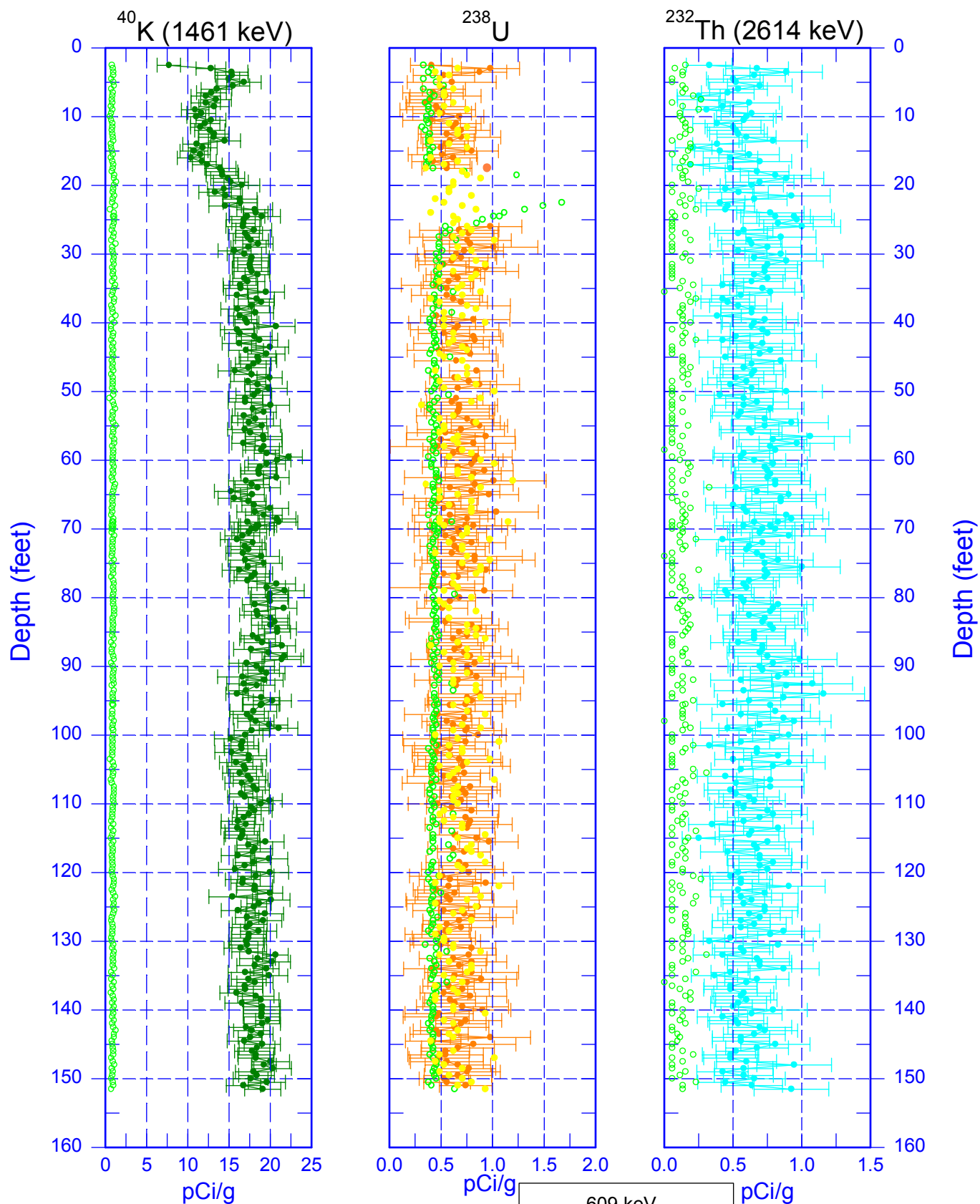


Zero Reference = Top of Casing

Date of Last Logging Run  
03/25/2002

# 299-E28-61 (A6812)

## Natural Gamma Logs



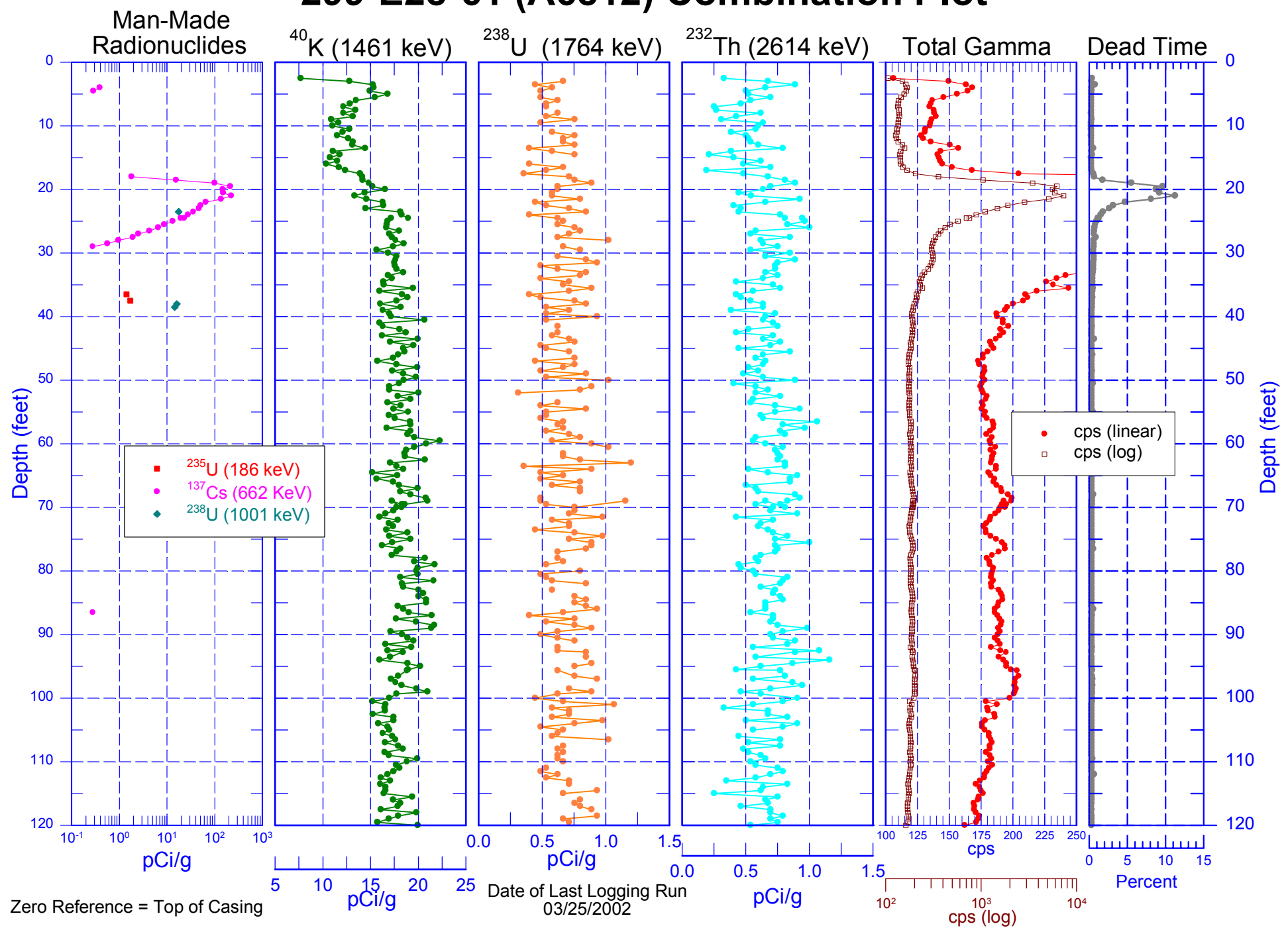
MDL

Zero Reference = Top of Casing

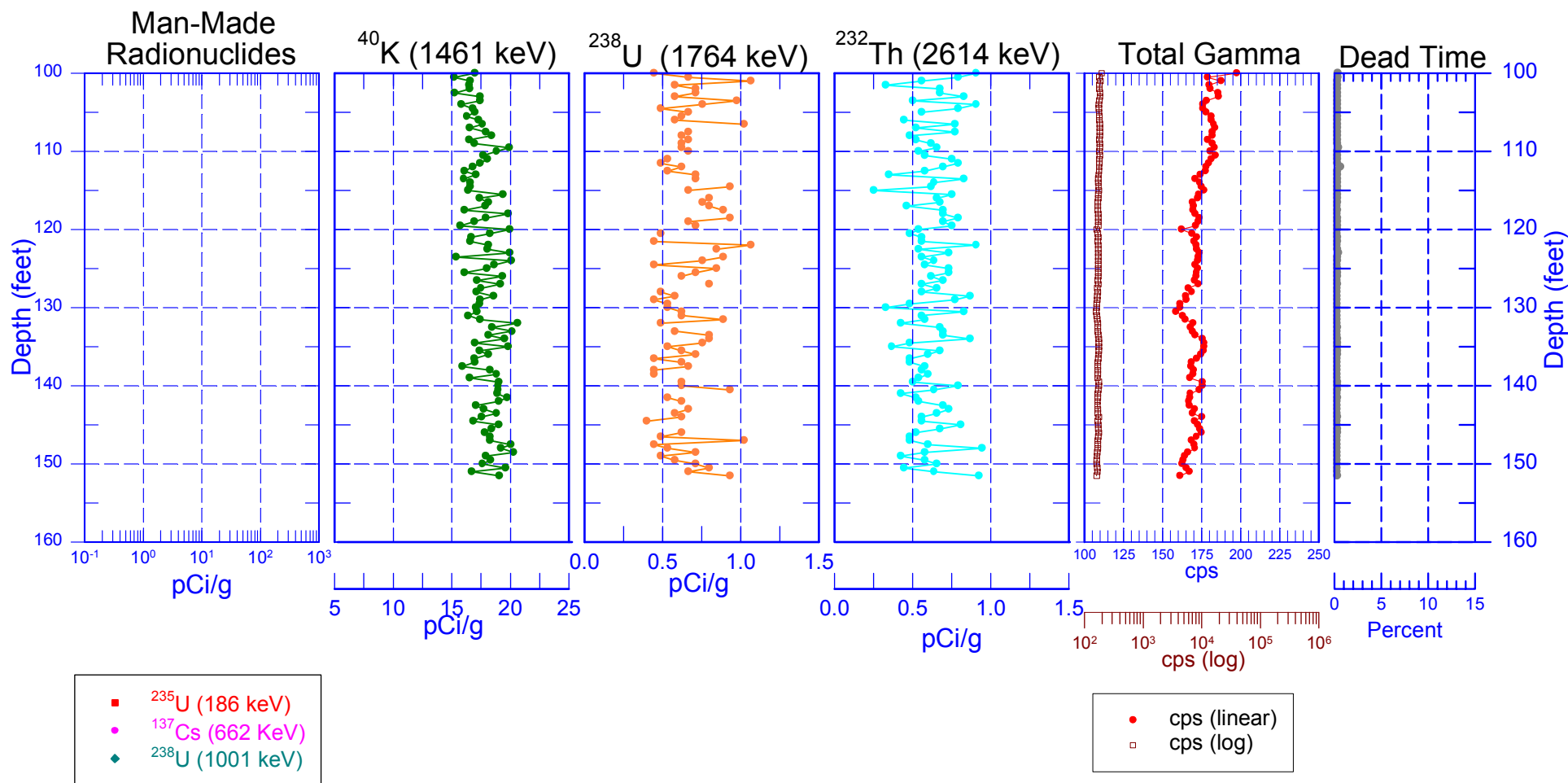
- 609 keV
- MDL (609 keV)
- 1764 keV

Date of Last Logging Run  
03/25/2002

# 299-E28-61 (A6812) Combination Plot



# 299-E28-61 (A6812) Combination Plot



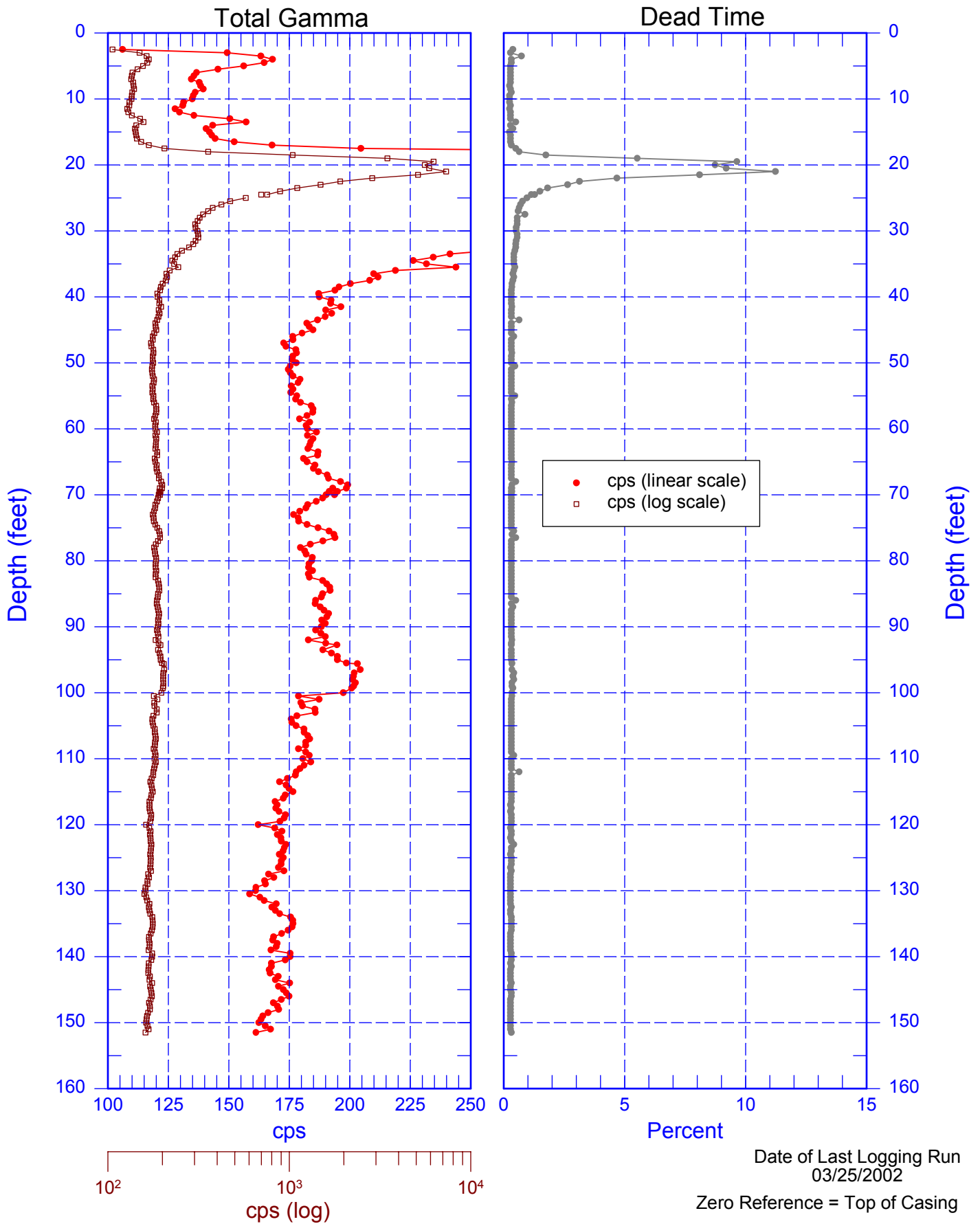
Zero Reference = Top of Casing

Date of Last Logging Run  
03/25/2002



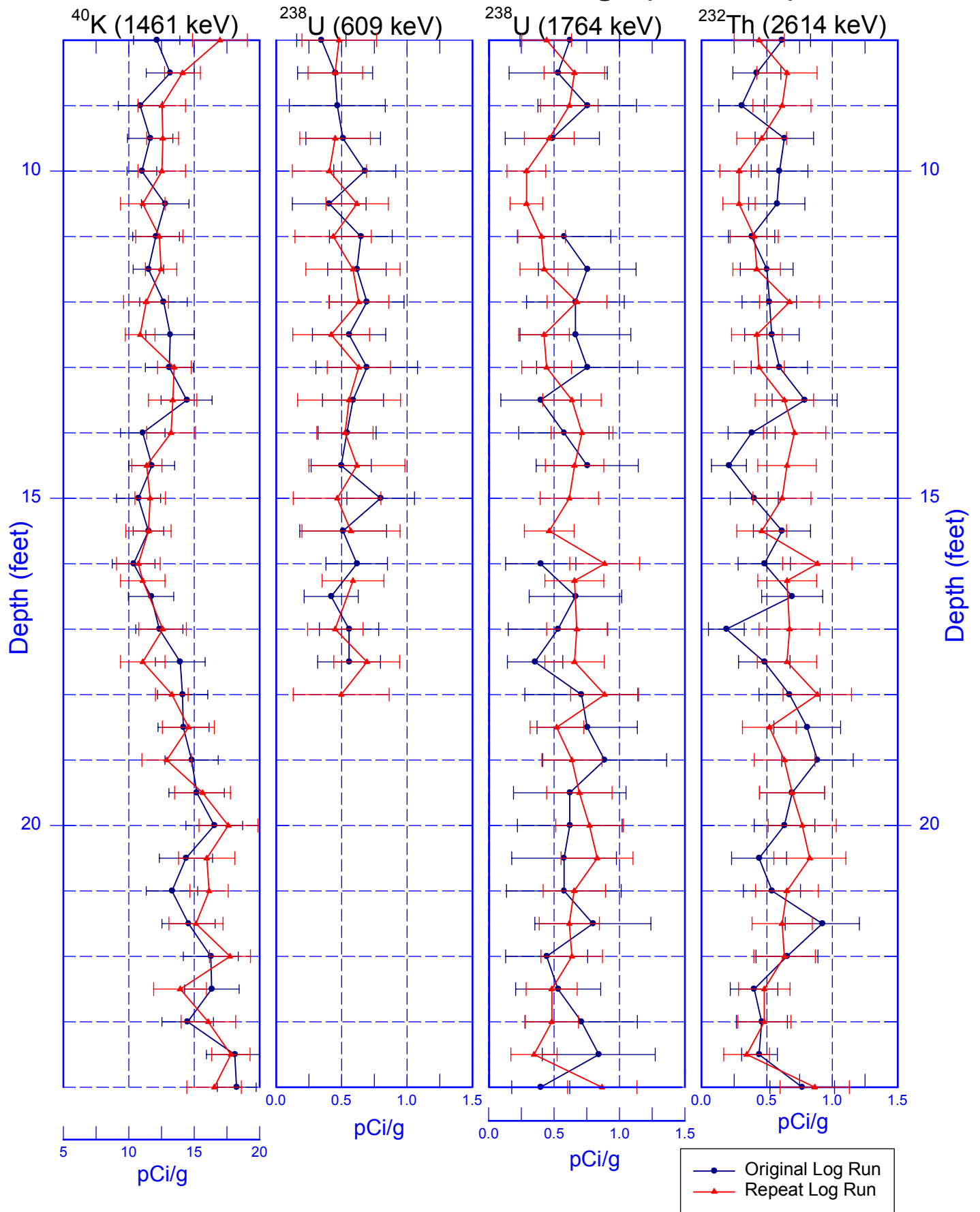
# 299-E28-61 (A6812)

## Total Gamma & Dead Time



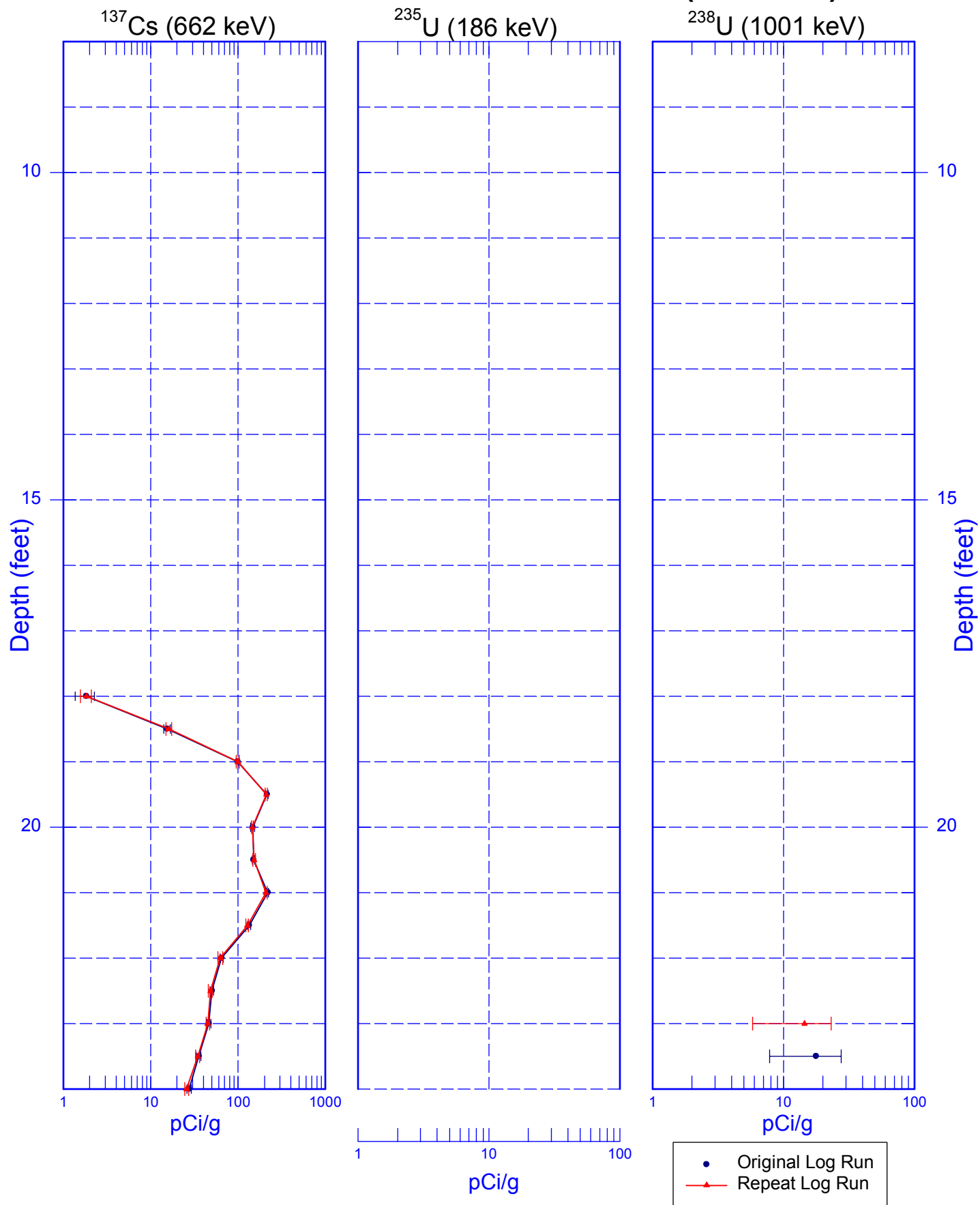
# 299-E28-61 (A6812)

## Rerun of Natural Gamma Logs (8 to 24 ft)



# 299-E28-61 (A6812)

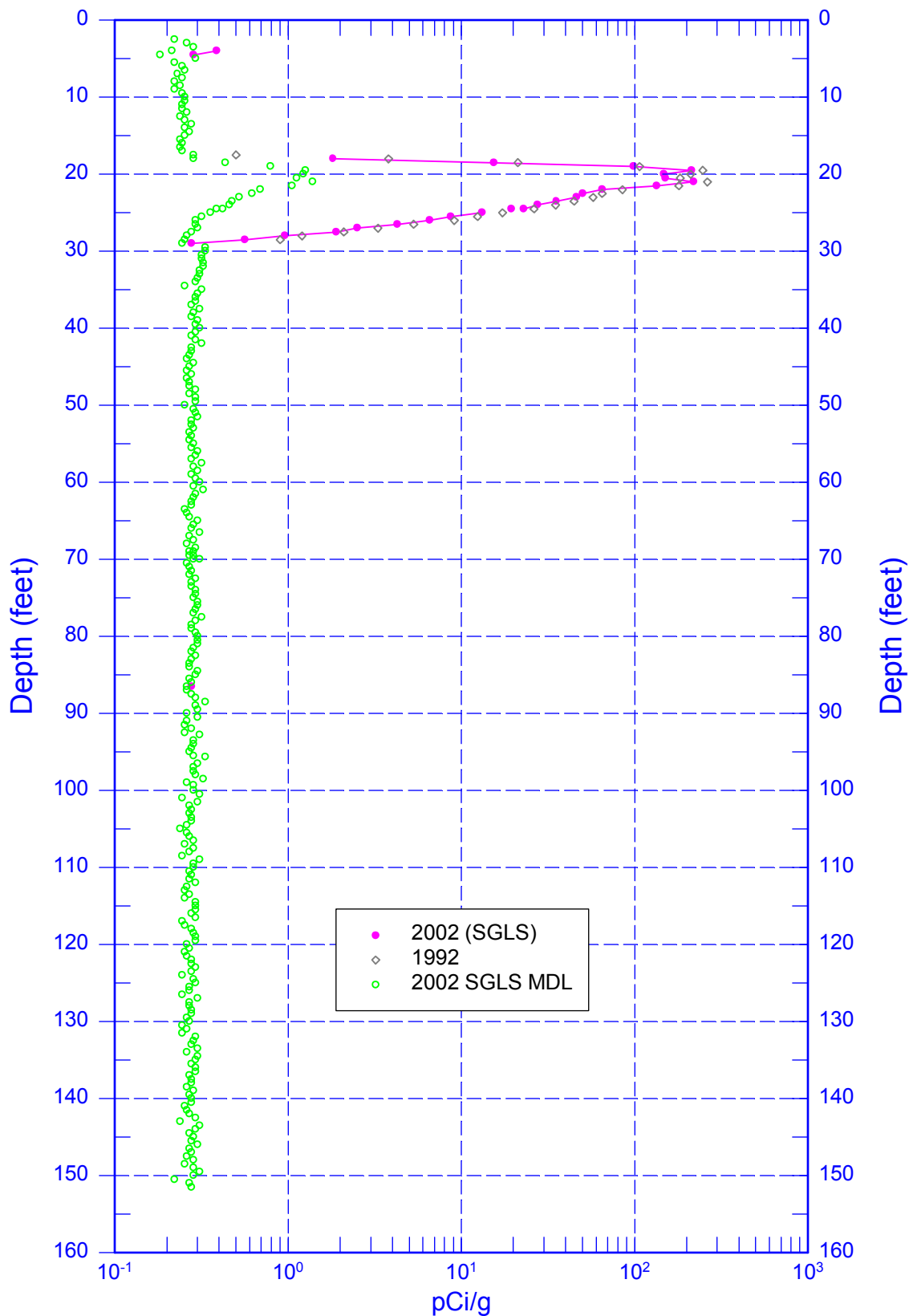
## Rerun of Man-Made Radionuclides (8 to 24 ft)



# 299-E28-61 (A6812)

RLS Data Compared to SGLS Data

$^{137}\text{Cs}$  Decayed to 03/25/2002



Zero Reference = Top of Casing (2002 SGLS)  
1992 RLS data shifted +2.5 ft to align with 2002 SGLS